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EXAMINATION OF O_3 PRODUCTION EFFICIENCIES IN THE NASHVILLE URBAN PLUME

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O_3 production efficiency in the Nashville Urban plume was examined from plots of O_3 versus NO_x oxidation products (NO_z), and from plots of O_3 versus (NO_z + 2*total-peroxide). The slope of the former is used as a measure of the efficiency with which the system utilizes NO_x in the formation of O_3, the slope of the latter can be thought of as a measure of the efficiency with which the system utilizes radicals where (NO_z + 2*t-peroxide) is taken to represent the concentration of radical sink species. In crosswind transects of the Nashville urban plume at varying distances downwind of the city, it was generally found that slopes of both of these plots varied smoothly across the plume with efficiencies highest at the plume edges and lowest at plume center. dO_3/dNO_z ranged between 3-10 at plume edges, and in some instances dropped to <1 at plume center. Similarly, $dO_3/d(NO_z + 2*$ t-peroxide) was highest at plume edges (9-14) and lowest at plume center, occasionally decreasing to values <2. Companion cross plume plots of the indicator ratio (t-peroxide/NO_z) suggested that O_3 production was typically limited by the availability of NO_x at plume edges, and by the concentration of reactive organics gases (ROG) at plume center. It may thus be inferred that lowered O_3 production efficiency in the context of both NO_x and radicals at plume center, is the result of the limited availability of ROG relative to the amount of NO_x.

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